PROPOSED REPORT
May 2003

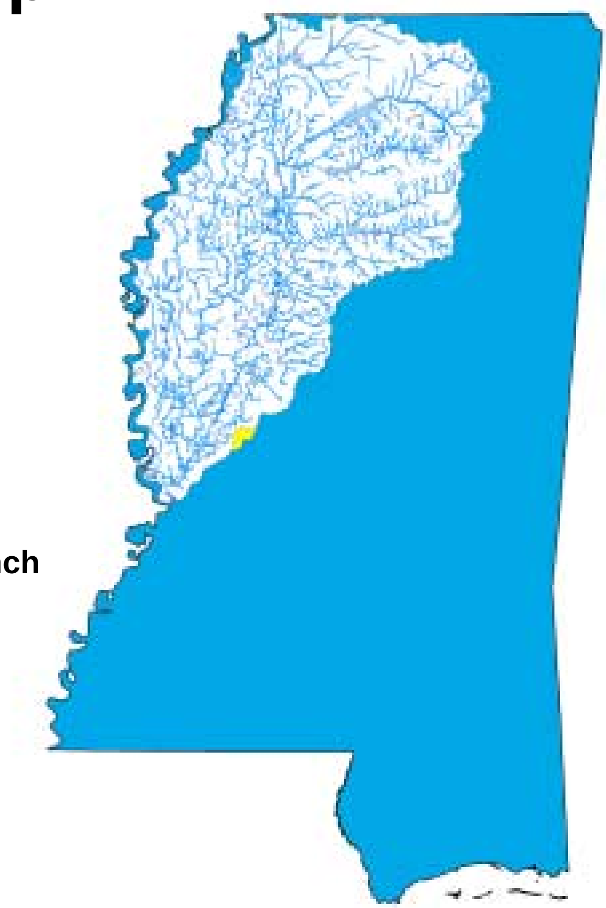
Total Maximum Daily Load

For Conductivity

Perry Creek and Thompson Creek

Yazoo River Basin

Yazoo County Mississippi



Prepared By

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FOREWORD

This report has been prepared in accordance with the schedule contained within the federal consent decree dated December 22, 1998. The report contains one or more Total Maximum Daily Loads (TMDLs) for water body segments found on Mississippi's 1996 Section 303(d) List of Impaired Water bodies. Because of the accelerated schedule required by the consent decree, many of these TMDLs have been prepared out of sequence with the State's rotating basin approach. The implementation of the TMDLs contained herein will be prioritized within Mississippi's rotating basin approach.

The amount and quality of the data on which this report is based are limited. As additional information becomes available, the TMDLs may be updated. Such additional information may include water quality and quantity data, changes in pollutant loadings, or changes in landuse within the watershed. In some cases, additional water quality data may indicate that no impairment exists.

Prefixes for fractions and multiples of SI units

Fraction	Prefix	Symbol	Multiple	Prefix	Symbol
10^{-1}	deci	d	10	deka	da
10^{-2}	centi	c	10^{2}	hecto	h
10^{-3}	milli	m	10^{3}	kilo	k
10^{-6}	micro	μ	10^{6}	mega	M
10^{-9}	nano	n	10^{9}	giga	G
10^{-12}	pico	p	10^{12}	tera	T
10^{-15}	femto	f	10^{15}	peta	P
10^{-18}	atto	a	10^{18}	exa	E

Conversion Factors

To convert from	To	Multiply by	To Convert from	To	Multiply by
Acres	Sq. miles	0.0015625	Days	Seconds	86400
Cubic feet	Cu. Meter	0.028316847	Feet	Meters	0.3048
Cubic feet	Gallons	7.4805195	Gallons	Cu feet	0.133680555
Cubic feet	Liters	28.316847	Hectares	Acres	2.4710538
cfs	Gal/min	448.83117	Miles	Meters	1609.344
cfs	MGD	.6463168	mg/l	ppm	1
Cubic meters	Gallons	264.17205	μg/l * cfs	Gm/day	2.45

CONTENTS

TMDL INFORMATION PAGE

i. Listing Information

Name	ID	County	HUC	Cause	Mon/Eval
Perry Creek	MS369M2	Yazoo	08030206	Salinity / TDS / Chlorides	Monitored
Near Oil City from Headwaters near Ditch Branch to O'Neal Creek					
Thompson Creek	MS369M3	Yazoo	08030206	Salinity / TDS / Chlorides	Monitored
At Tinsley from Headwaters to confluence with Perry Creek					

ii. Water Quality Standard

Parameter	Beneficial use	Water Quality Criteria
Conductivity	Fish and Wildlife	There shall be no substances added to increase the conductivity above 1000 micromhos/cm for freshwater streams

iii. NPDES Facilities

NPDES ID	Facility Name	Permitted Discharge (MGD)	Receiving Water
None			

iv. Phase 1 Total Maximum Daily Load for Coductivity Equivalents

LA (eq/day)	WLA (eq/day)	MOS	TMDL (eq/day)
292.9	2.96	implicit	295.9

EXECUTIVE SUMMARY

Perry Creek and Thompson Creek were included in the Mississippi 1998 Section 303(d) List of Water Bodies as monitored water body segments, due to Salinity / Total Dissolved Solids (TDS) / Chlorides. This listing was based on conductivity data collected that indicate impairment in the watershed. The applicable state standard specifies that there shall be no substances added to increase the conductivity above 1000 micromhos/cm for freshwater streams. The pollutant listing of Salinity / TDS / Chlorides shown in the 1998 list was generated due to the available options in EPA's old waterbody database. Conductivity impairments were shown as "Salinity / TDS / Chlorides" in the database. Multiplying the conductivity by a conversion factor and correcting for temperature derives salinity and TDS. Therefore, it is appropriate to develop this TMDL for conductivity.

The Perry and Thompson watershed is located in the southern end of the United States Geologic Survey (USGS) Hydrologic Unit Code (HUC) 08030206. The headwaters of Perry Creek begin near Mechanicsburg, Mississippi and flow north into O'Neal Creek. Thompson Creek flows from the headwaters in a western direction to its confluence with Perry Creek near Tinsley. The other community in the watershed is Oil City.

Tinsley Field is a giant oil field located in the watershed. On August 29, 1939 the first well in the area began pumping oil. Since then, the field has produced 219 million barrels of oil. At today's prices, this oil would be worth over $3.7 billon. The field has also produced 6.7 billion cubic feet of gas. (MDEQ, 1989)

The watershed remains littered with the remnants of the early oil and gas production wells and brine pits. These old wellheads, pipes, and brine pits are believed to be the source of excessive conductivity in these streams. There are no NPDES Permitted discharges located in the watershed. In 2002 a biological study was conducted on Perry Creek, which indicated the biological community is impaired in this watershed.

A mass-balance approach was used to develop this TMDL. The critical period was determined, based on monitoring results, to be during the months of August and September. Measurements of flow in Perry and Thompson Creeks are not available. Because of this, a flow coefficient was developed for this watershed based on flow data from the nearby Black Creek watershed. The flow coefficient was then applied to the Perry and Thompson watershed to estimate the flow for this watershed in the months of August and September.

Figure 1 Perry Creek

INTRODUCTION

1.1 Background

The identification of water bodies not meeting their designated use and the development of total maximum daily loads (TMDLs) for those water bodies are required by Section 303(d) of the Clean Water Act and the Environmental Protection Agency's (EPA) Water Quality Planning and Management Regulations (40 CFR part 130). The TMDL process is designed to restore and maintain the quality of those impaired water bodies through the establishment of pollutant specific allowable loads. The impairment is caused by elevated conductivity in the creek due to historic oil field development. Thus, this TMDL has been developed for conductivity for the 303(d) listed segments shown in Figure 2.

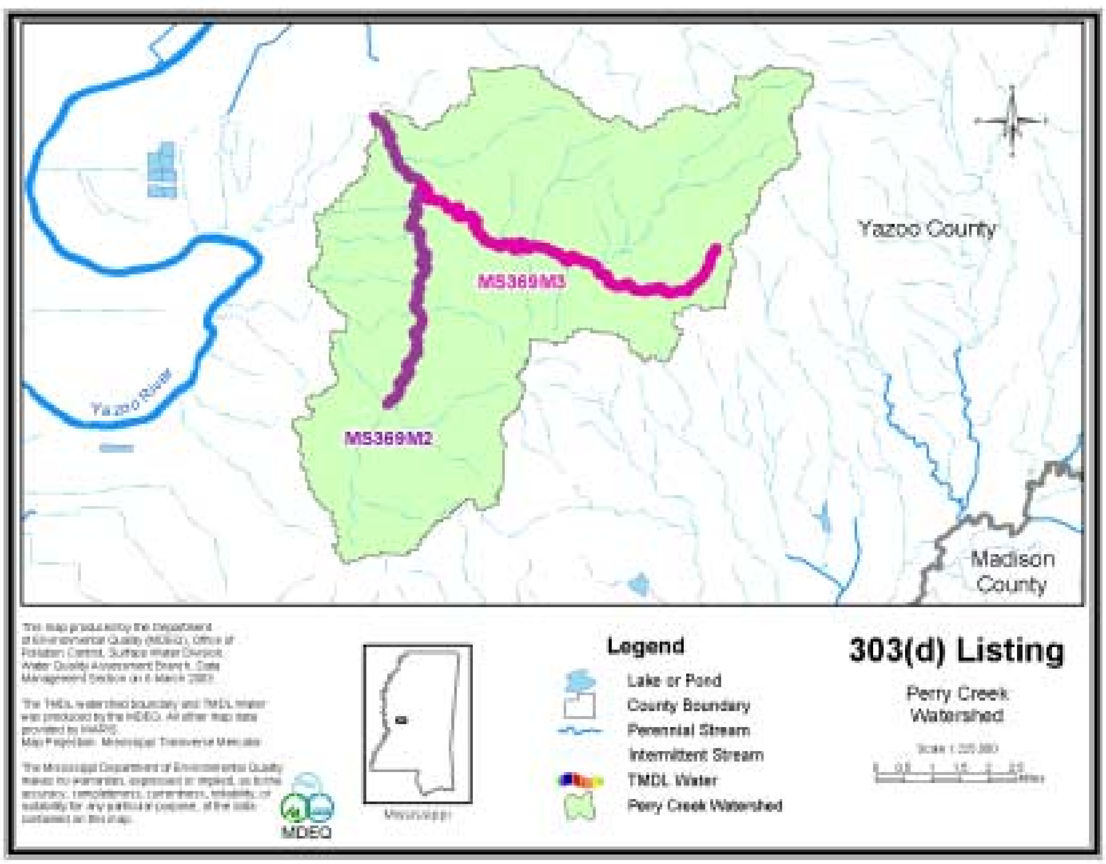

Figure 2. Black Bayou Watershed 303(d) Listed Segments

1.2 Discussion of Conductivity and Salinity

Conductivity *k* is a measure of the ability of an aqueous solution to carry an electric current. This ability depends on the presence of ions; on their total concentration, mobility, and valence; and on the temperature of measurement. Solutions of most inorganic compounds are relatively good conductors. Conversely, molecules of organic compounds that do not dissociate in aqueous solution conduct a current very poorly, if at all.

Conductance G is defined as the reciprocal of resistance, R:

$$G = 1/R$$

where the unit of R is ohm and G is ohm^{-1} (sometimes written mho). Conductance of a solution is measured between two spatially fixed and chemically inert electrodes. To avoid polarization at the electrode surfaces, the conductance measurement is made with an alternating current signal. The conductance of a solution, G is directly proportional to the electrode surface area, A, cm^2, and inversely proportional to the distance between the electrodes, L, cm. The constant of proportionality, k such that:

$$G = k\left(\frac{A}{L}\right)$$

is called "conductivity" (preferred to "specific conductance"). It is a characteristic property of the solution between the electrodes. The units of k are 1/ohm-cm or mho per centimeter. Conductivity is customarily reported in micromhos per centimeter (µmho/cm).

To compare conductivities, values of k are reported relative to electrodes with A=1 cm^2 and L=1 cm. The equivalent conductivity, Λ, of a solution is the conductivity per unit of concentration. As the concentration is decreased toward zero, Λ approaches a constant, designated as $\Lambda°$. With k in units of micromhos per centimeter it is necessary to convert concentration to units of equivalents per cubic centimeter; therefore

$$\Lambda = 0.001k\ /\ concentration$$

where the units of Λ, k, and concentration are mho-cm^2/equivalent, µmho/cm, and equivalent/L, respectively. (Standard Methods, 20th Edition 2-44)

Salinity is an important unitless property of industrial and natural waters. It was originally conceived as a measure of the mass of dissolved salts in a given mass of solution. The experimental determination of the salt content by drying and weighing presents some difficulties due to the loss of some components. The only reliable way to determine the true or absolute salinity of natural water is to make a complete chemical analysis. However, this method is time-consuming and cannot yield the precision necessary for accurate work. Thus, to determine salinity, one normally uses indirect methods involving the measurement of conductivity. From an empirical relationship of salinity and the physical property determined for a standard solution it is possible to calculate salinity. Because of its high sensitivity and ease of measurement, the conductivity method is most commonly used to determine salinity. (Standard Methods, 20th Edition 2-48)

1.3 Applicable Water Body Segment Use

The water use classification for the listed segments of Perry and Thompson Creeks as established by the State of Mississippi in the *Water Quality Criteria for Intrastate, Interstate and Coastal Waters* regulation, is Fish and Wildlife Support. The designated beneficial uses for Perry and Thompson Creeks are Aquatic Life Support.

1.4 Applicable Water Body Segment Standard

The water quality standard applicable to the use of the water body and the pollutant of concern is defined in the *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters*. The applicable standard specifies that there shall be no substances added to increase the conductivity above 1000 micromhos/cm for freshwater streams. This water quality standard will be used as the targeted endpoint to evaluate impairments and establish this TMDL.

1.5 Selection of a Critical Condition

There are no point sources discharging in the watershed. Therefore, the excessive conductivity is being produced by runoff from stormwater or from leaking pipes or brine pits. A review of the data show the highest conductivity readings are typically taken during the months of August and September. These months were selected as the critical period for this TMDL.

1.6 Selection of a TMDL Endpoint

One of the major components of a TMDL is the establishment of instream numeric endpoints, which are used to evaluate the attainment of acceptable water quality. Instream numeric endpoints, therefore, represent the water quality goals that are to be achieved by meeting the load and wasteload allocations specified in the TMDL. The endpoints allow for a comparison between observed instream conditions and conditions that are expected to restore designated uses. The instream conductivity target for this TMDL is 1,000 micromhos per centimeter (μmho/cm).

The original listing is "Salinity / TDS / Chlorides." Each of these is empirically determined from the conductivity and temperature readings taken in-situ. In fact one can turn the dial on the meter and the calculations are completed internally in the instrument to give conductivity, salinity, and TDS readings at one time. Therefore, it is appropriate to select the conductivity standard as the endpoint or target for this TMDL.

WATER BODY ASSESSMENT

This TMDL Report includes an analysis of available water quality data and the identification of all known potential pollutant sources in the Perry and Thompson watershed. The potential point and nonpoint pollutant sources are unknown, but were characterized by the best available information, monitoring data, and literature values. This section documents the available information for Perry and Thompson Creeks and the tributaries.

2.1 Discussion of Instream Water Quality Data

The State's 1998 Section 305(b) Water Quality Assessment Report was reviewed to assess water quality conditions and data available for the 303(d) listed water bodies in the Perry / Thompson watershed. Conductivity water quality data are available for the listed segments. According to the 305b report these water bodies are not supporting for the use of aquatic life support. These conclusions were based on instantaneous water chemistry collected at numerous monitoring stations located within the watershed. Monthly monitoring data are available from the Tinsley Field Study by a private consult, Eco Systems, at 12 instream stations. The data available from these locations for conductivity are given in Appendix A.

The data were collected at 7 stations in Perry Creek and 5 stations in Thompson Creek. One station in O'Neal Creek is also shown as the downstream station. The proximity to the oil wells and the tributaries also plays an important factor in the interpretation of the data.

2.2 Discussion of the Critical Period

The critical period as determined from the review of the data occurs in August and September. In both streams, the data exceeded the standard for most of the year. The greatest exceedance was in the late summer months. This could possibly be due to high flows and warmer stream temperature. Additionally, in 1994 the average flow in the nearby Black Creek watershed was more than double the average flow for the period of record.

2.3 Assessment of Point Sources

The first step in assessing pollutant sources in the watershed was locating the NPDES permitted sources. There are no NPDES facilities permitted to discharge in the watershed. There are five abandoned sand and gravel mines and several oil or gas wells in the watershed, but these facilities do not have a NPDES Permit. The large white areas shown in the satellite picture on the next page are the abandoned mines. The small white cleared areas are oil or gas wells. The town of Tinsley is visible at the top of the picture, Figure 3.

2.4 Assessment of Nonpoint Sources

Nonpoint loading resulting in increased conductivity in the water body results from the transport of the pollutants into receiving waters by overland surface runoff and groundwater infiltration. Landuse activities within the drainage basin, such as drilling and mining contribute to nonpoint source loading. Other nonpoint pollution sources include atmospheric deposition and natural weathering of rocks and soil.

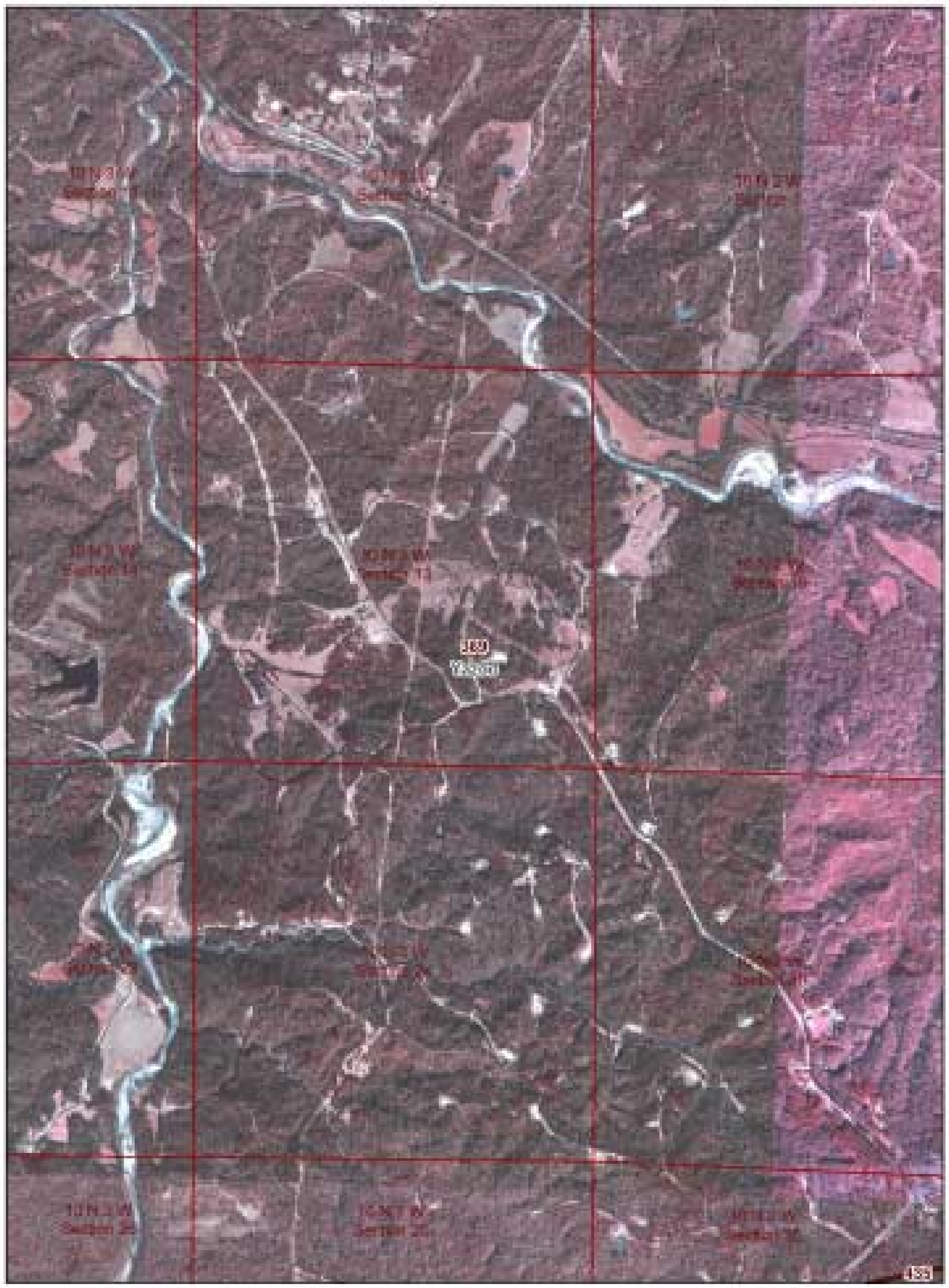

Figure 3 Satellite Image of Perry and Thompson Watershed

Little information is available which can be used to quantify a cause and effect relationship between observed saline flows and the identified sources. After decades of oil and gas production throughout the watershed, it can be concluded that conductivity loading is the direct result of improperly plugged wells, abandoned brine pits, rainfall runoff transporting pollutants to surface waters, or an indirect result of groundwater migration through abandoned or improperly cased oil wells. Historical practices of brine discharges from active wells have elevated concentrations at the surface layer. (Parsons, 2002)

The 28,000-acre drainage area contains many different landuse types, including urban, forest, cropland, pasture, water, and wetlands. The landuse information is based on data collected by the State of Mississippi's Automated Resource Information System (MARIS) 1997. This data set is based on Landsat Thematic Mapper digital images taken between 1992 and 1993. Forestry is the dominant landuse within this watershed. The landuse distribution within the watershed is shown in Table 5 and Figure 4.

Figure 4. Landuse Distribution Map for Perry / Thompson Watershed

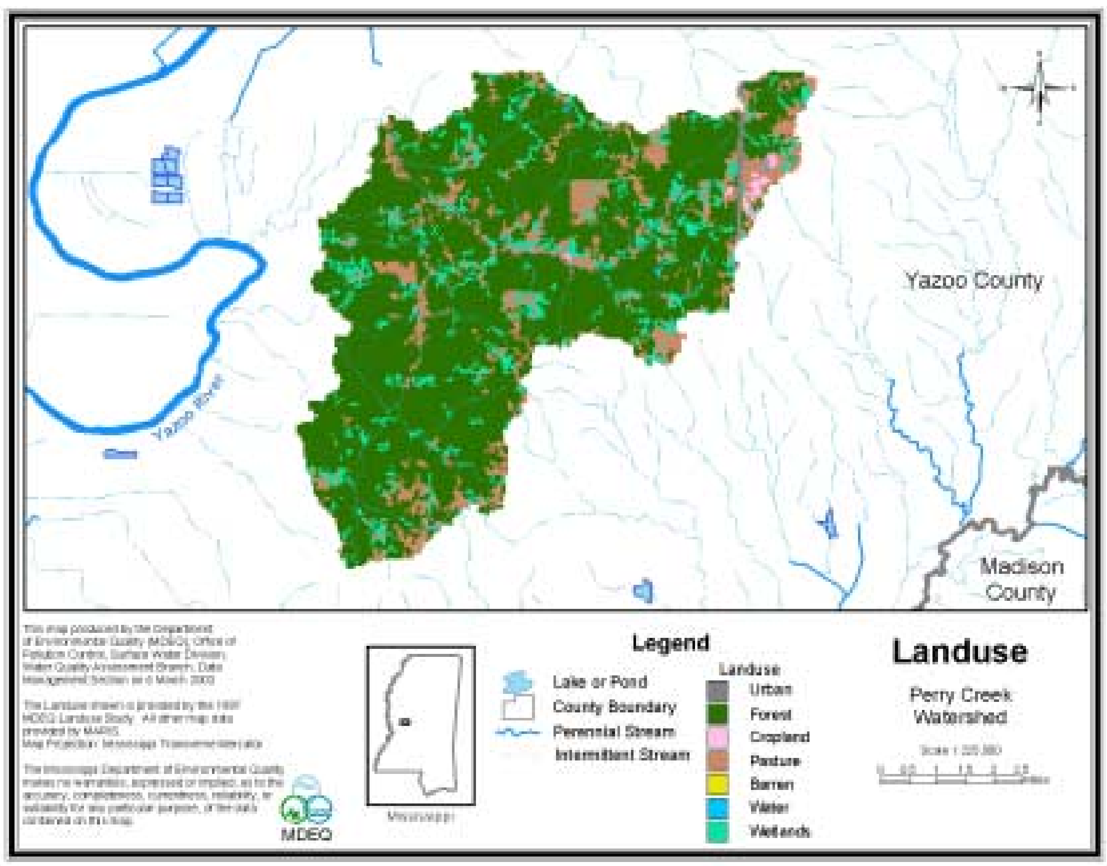

Table 5. Landuse Distribution, Perry / Thompson Watershed

	Urban/ Transportation	Forest	Agriculture and Scrub	Water	Total
Area (acres)	148	20,893	6694	31	27766
Percentage	0.5%	75%	24%	0.1%	100%

TMDL CALCULATIONS

Establishing the relationship between the instream water quality target and the source loading is a critical component of TMDL development. It allows for the evaluation of management options that will achieve the desired source load reductions. The link can be established through a range of techniques, from qualitative assumptions based on sound scientific principles to sophisticated modeling techniques. Ideally, the linkage will be supported by monitoring data that allow the TMDL developer to associate certain water body responses to flow and loading conditions. In this section, the selection of the TMDL estimation procedures is discussed.

3.1 Flow Estimation

There are no gages available in the watershed to determine flow accurately. Therefore, flow has been determined by finding a nearby watershed and comparing the size of both watersheds. In this case, Black Creek in Lexington, Mississippi USGS 07287400 was selected as the nearest watershed with somewhat similar features and geography. The Black Creek watershed is 88.1 square miles. The average annual flow in Black Creek is 148 cfs. However, in August and September 1994 the monthly average flows were 113 and 110 respectively. The average of 111.5 will be used for this TMDL. The available water quality data were collected in 1994. The Perry and Thompson watershed is 43.4 square miles. The monthly average flow can be estimated by comparing the sizes of the watersheds.

$$\frac{43.4 sqmile}{88.1 sqmile} * 111.5 cfs = 54.9 cfs$$

3.2 Load Evaluation

A mass balance approach was used to estimate this TMDL. Conductivity loading was calculated using the conductivity data and the monthly average flow during the critical period. The following equation can be used to calculate the conductivity load:

$$Concentration(0.001 k / \Lambda) * Qcfs * 5.39$$

where C equals concentration in equivalents/L and Q equals average monthly flow in cfs. An expression for the loading can be developed by setting one critical or representative flow and concentration, and calculating the conductivity load using these equations. The conversion factor will change the equation from a concentration to a load per day.

The critical period has been determined as August and September where the conductivity readings were the highest in both streams according to the data. The average conductivity for August and September is 2977 μmho/cm. The average conductivity load during the critical period is:

$$0.001 * 2977 \mu mho / cm * 54.9 cfs * 5.39 = 880.9 eq / d$$

The target load is calculated by substituting the standard or 1000 μmho/cm for k and determining the equivalent load.

$$0.001 * 1000 \mu mho / cm * 54.9 cfs * 5.39 = 295.9 eq / d$$

Therefore, the TMDL equals 295.9 equivalents per day. The needed reduction can be calculated by comparing the target load to the critical period load.

$$\frac{(880.9 - 295.9)}{880.9} = 66\% reduction$$

The same percent reduction is calculated from the concentrations involved in the measured conductivity and the water quality standard.

$$\frac{2977 umho / cm - 1000 umho / cm}{2977 umho / cm} = 66\% reduction$$

ALLOCATION

4.1 Wasteload Allocation

There are no known NPDES Permits in the watershed. However it is conceivable that a stormwater construction activity could take place that would need stormwater discharge permitting. Therefore MDEQ has determined that 1% of the overall TMDL load should be allocated to the WLA portion of the TMDL. This represents twice the percent of urban area in the watershed. This represents a preliminary estimation of the potential stormwater permitting that would include conductivity generated by stormwater runoff. The WLA equals 2.96 equivalents per day.

4.2 Load Allocation

The load allocation is the remaining available TMDL load. This equals 292.9 equivalents per day. This is based on the estimated critical flow of 54.9cfs.

4.3 Incorporation of a Margin of Safety

The margin of safety is a required component of a TMDL and accounts for the uncertainty about the relationship between pollutant loads and the quality of the receiving water body. The two types of MOS development are to implicitly incorporate the MOS using conservative model assumptions or to explicitly specify a portion of the total TMDL as the MOS. The MOS selected for this model is implicit.

The TMDL is based on the critical condition of the water body, which is represented by the flow condition that occurs during the months of August and September 1994. The average flow for the period of record for these months is much less because 1994 was a wet year in this watershed. Determining the TMDL for the water body at this flow provides protection during the worst-case scenario.

4.4 Seasonality

Taking the year long record of data and determining the critical period address seasonality. Reductions calculated for the critical period are the maximum needed during the year.

CONCLUSION

This TMDL is based on a desktop approach using MDEQ's regulatory assumptions and literature values. The results indicate impairment in the stream and a needed reduction from nonpoint sources. This TMDL recommends that no NPDES permit be issued for Perry Creek or Thompson Creek if the effluent would cause or contribute to an increase in conductivity. Further, this watershed needs cleanup activities to reduce the overall nonpoint source load which is causing the conductivity to be above the standard.

5.1 Future Monitoring

MDEQ has adopted the Basin Approach to Water Quality Management, a plan that divides Mississippi's major drainage basins into five groups. During each yearlong cycle, MDEQ's resources for water quality monitoring will be focused on one of the basin groups. During the next monitoring phase in the Yazoo Basin, the Perry / Thompson watershed may receive additional monitoring to identify any change in water quality.

5.2 Public Participation

This TMDL will be published for a 30-day public notice. During this time, the public will be notified by publication in the statewide newspaper. The public will be given an opportunity to review the TMDL and submit comments. MDEQ also distributes all TMDLs at the beginning of the public notice to those members of the public who have requested to be included on a TMDL mailing list. TMDL mailing list members may request to receive the TMDL reports through either, email or the postal service. Anyone wishing to become a member of the TMDL mailing list should contact Greg Jackson at (601) 961-5098 or Greg_Jackson@deq.state.ms.us.

At the end of the 30-day period, MDEQ will determine the level of interest in the TMDL and make a decision on the necessity of holding a public meeting. If a public meeting is deemed appropriate, the public will be given a 30-day notice of the meeting to be held at a location near the watershed. All comments received during the public notice period and at any public hearings become a part of the record of this TMDL. All comments will be considered in the submission of this TMDL to EPA Region 4 for final approval.

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DEFINITIONS

Activated Sludge: A secondary wastewater treatment process that removes organic matter by mixing air and recycled sludge bacteria with sewage to promote decomposition

Aerated Lagoon: A relatively deep body of water contained in an earthen basin of controlled shape which is equipped with a mechanical source of oxygen and is designed for the purpose of treating wastewater.

Ambient Stations: A network of fixed monitoring stations established for systematic water quality sampling at regular intervals, and for uniform parametric coverage over a long-term period.

Assimilative Capacity: The capacity of a body of water or soil-plant system to receive wastewater effluents or sludge without violating the provisions of the State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters and Water Quality regulations.

Background: The condition of waters in the absence of man-induced alterations based on the best scientific information available to MDEQ. The establishment of natural background for an altered water body may be based upon a similar, unaltered or least impaired, water body or on historical pre-alteration data.

Biological Impairment: Condition in which at least one biological assemblages (e.g. , fish, macroinvertebrates, or algae) indicates less than full support with moderate to severe modification of biological community noted.

Chloride: (Cl^-) one of the major inorganic anions in water and wastewater. Chloride concentration is higher in wastewater than in raw water because sodium chloride (NaCl) is a common article of diet and passes unchanged through the digestive system.

Conductivity: Measure of the ability of an aqueous solution to carry an electric current. This ability depends on the presence of ions; on their total concentration, mobility, and valence; and on the temperature of measurement.

Conventional Lagoon: An un-aerated, relatively shallow body of water contained in an earthen basin of controlled shape and designed for the purpose of treating water.

Critical Condition: Hydrologic and atmospheric conditions in which the pollutants causing impairment of a water body have their greatest potential for adverse effects.

Daily Discharge: The “discharge of a pollutant” measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the "daily average" is calculated as the average.

Designated Use: Use specified in water quality standards for each water body or segment regardless of actual attainment.

Discharge Monitoring Report: Report of effluent characteristics submitted by a NPDES Permitted facility.

Effluent Standards and Limitations: All State or Federal effluent standards and limitations on quantities, rates, and concentrations of chemical, physical, biological, and other constituents to which a waste or wastewater discharge may be subject under the Federal Act or the State law. This includes, but is not limited to, effluent limitations, standards of performance, toxic effluent standards and prohibitions, pretreatment standards, and schedules of compliance.

Effluent: Treated wastewater flowing out of the treatment facilities.

First Order Kinetics: Describes a reaction in which the rate of transformation of a pollutant is proportional to the amount of that pollutant in the environmental system.

Groundwater: Subsurface water in the zone of saturation. Groundwater infiltration describes the rate and amount of movement of water from a saturated formation.

Impaired Water body: Any water body that does not attain water quality standards due to an individual pollutant, multiple pollutants, pollution, or an unknown cause of impairment.

Land Surface Runoff: Water that flows into the receiving stream after application by rainfall or irrigation. It is a transport method for nonpoint source pollution from the land surface to the receiving stream.

Load Allocation (LA): The portion of a receiving water's loading capacity attributed to or assigned to nonpoint sources (NPS) or background sources of a pollutant

Loading: The total amount of pollutants entering a stream from one or multiple sources.

Mass Balance: An equation that accounts for the flux of mass going into a defined area and the flux of mass leaving a defined area, the flux in must equal the flux out.

Nonpoint Source: Pollution that is in runoff from the land. Rainfall, snowmelt, and other water that does not evaporate become surface runoff and either drains into surface waters or soaks into the soil and finds its way into groundwater. This surface water may contain pollutants that come from land use activities such as agriculture; construction; silviculture; surface mining; disposal of wastewater; hydrologic modifications; and urban development.

NPDES Permit: An individual or general permit issued by the Mississippi Environmental Quality Permit Board pursuant to regulations adopted by the Mississippi Commission on Environmental Quality under Mississippi Code Annotated (as amended) §§ 49-17-17 and 49-17-29 for discharges into State waters.

Point Source: Pollution loads discharged at a specific location from pipes, outfalls, and conveyance channels from either wastewater treatment plants or industrial waste treatment facilities. Point sources can also include pollutant loads contributed by tributaries to the main receiving stream.

Pollution: Contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the State, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance, or leak into any waters of the State, unless in compliance with a valid permit issued by the Permit Board.

Publicly Owned Treatment Works (POTW): A waste treatment facility owned and/or operated by a public body or a privately owned treatment works which accepts discharges which would otherwise be subject to Federal Pretreatment Requirements.

Regression Coefficient: An expression of the functional relationship between two correlated variables that is often empirically determined from data, and is used to predict values of one variable when given values of the other variable.

Salinity: Measure of the mass of dissolved salts in a given mass of solution.

Storm Runoff: Rainfall that does not evaporate or infiltrate the ground because of impervious land surfaces or a soil infiltration rate than rainfall intensity, but instead flows into adjacent land or water bodies or is routed into a drain or sewer system.

Total Maximum Daily Load or TMDL: The calculated maximum permissible pollutant loading to a water body at which water quality standards can be maintained.

Waste: Sewage, industrial wastes, oil field wastes, and all other liquid, gaseous, solid, radioactive, or other substances which may pollute or tend to pollute any waters of the State.

Wasteload Allocation (WLA): The portion of a receiving water's loading capacity attributed to or assigned to point sources of a pollutant.

Water Quality Standards: The criteria and requirements set forth in *State of Mississippi Water Quality Criteria for Intrastate, Interstate, and Coastal Waters*. Water quality standards are standards composed of designated present and future most beneficial uses (classification of waters), the numerical and narrative criteria applied to the specific water uses or classification, and the Mississippi antidegradation policy.

Water Quality Criteria: Elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports the present and future most beneficial uses.

Waters of the State: All waters within the jurisdiction of this State, including all streams, lakes, ponds, wetlands, impounding reservoirs, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies or accumulations of water, surface and underground, natural or artificial, situated wholly or partly within or bordering upon the State, and such coastal waters as are within the jurisdiction of the State, except lakes, ponds, or other surface waters which are wholly landlocked and privately owned, and which are not regulated under the Federal Clean Water Act (33 U.S.C.1251 et seq.).

Watershed: The area of land draining into a stream at a given location.

ABBREVIATIONS

7Q10.......................... Seven-Day Average Low Stream Flow with a Ten-Year Occurrence Period

BASINS ....Better Assessment Science Integrating Point and Nonpoint Sources

BMP ....Best Management Practice

CWA ....Clean Water Act

DMR .... Discharge Monitoring Report

EPA ....Environmental Protection Agency

GIS ....Geographic Information System

HUC ....Hydrologic Unit Code

LA .... Load Allocation

MARIS..Mississippi Automated Resource Information System

MDEQ.. Mississippi Department of Environmental Quality

MGD .... Million Gallons per Day

MOS... Margin of Safety

NPDES... National Pollution Discharge Elimination System

RBA .... Rapid Biological Assessment

TDS ....Total Dissolved Solids

USGS .... United States Geological Survey

WLA .... Waste Load Allocation

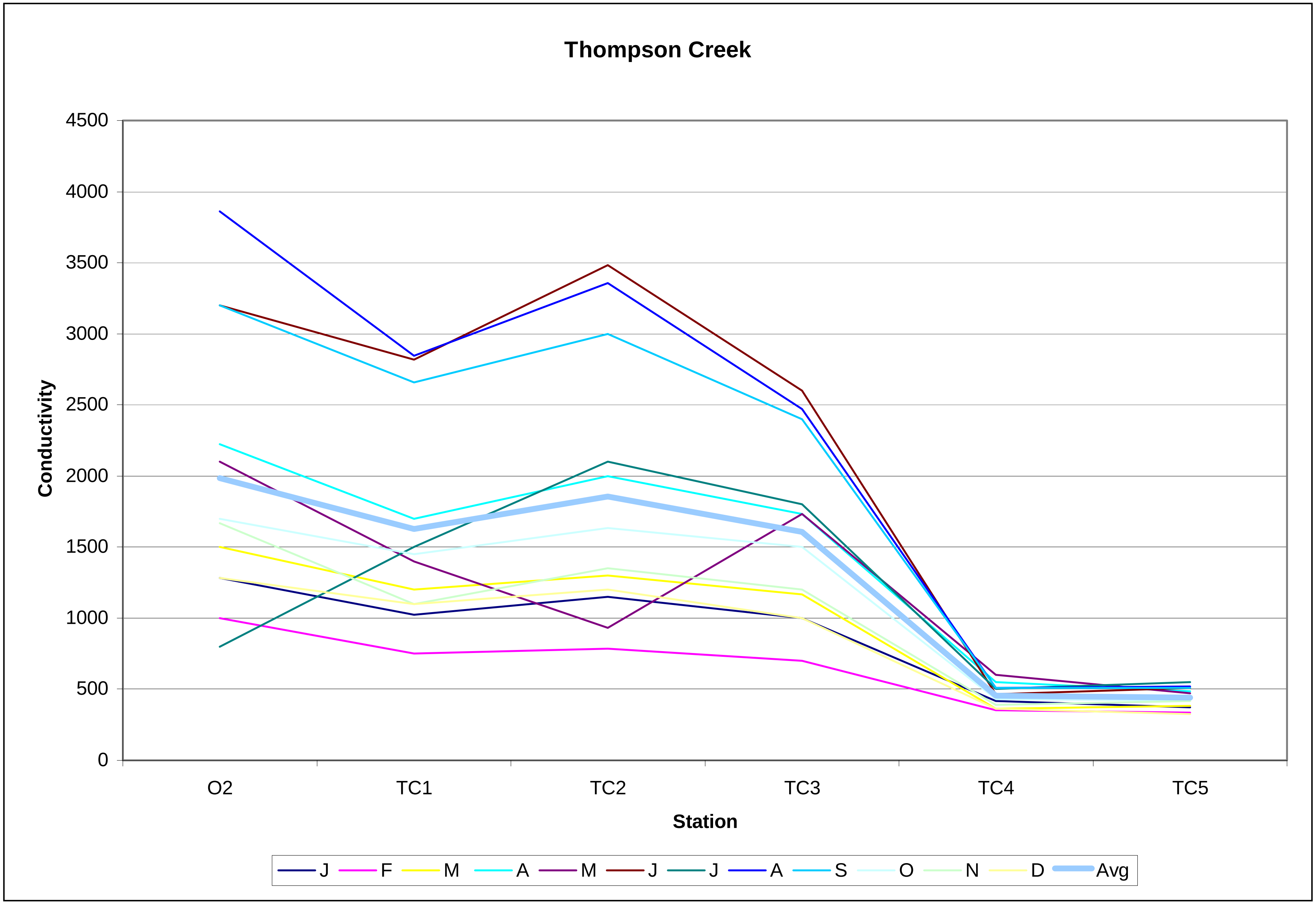
WWTP ....Wastewater Treatment Plant

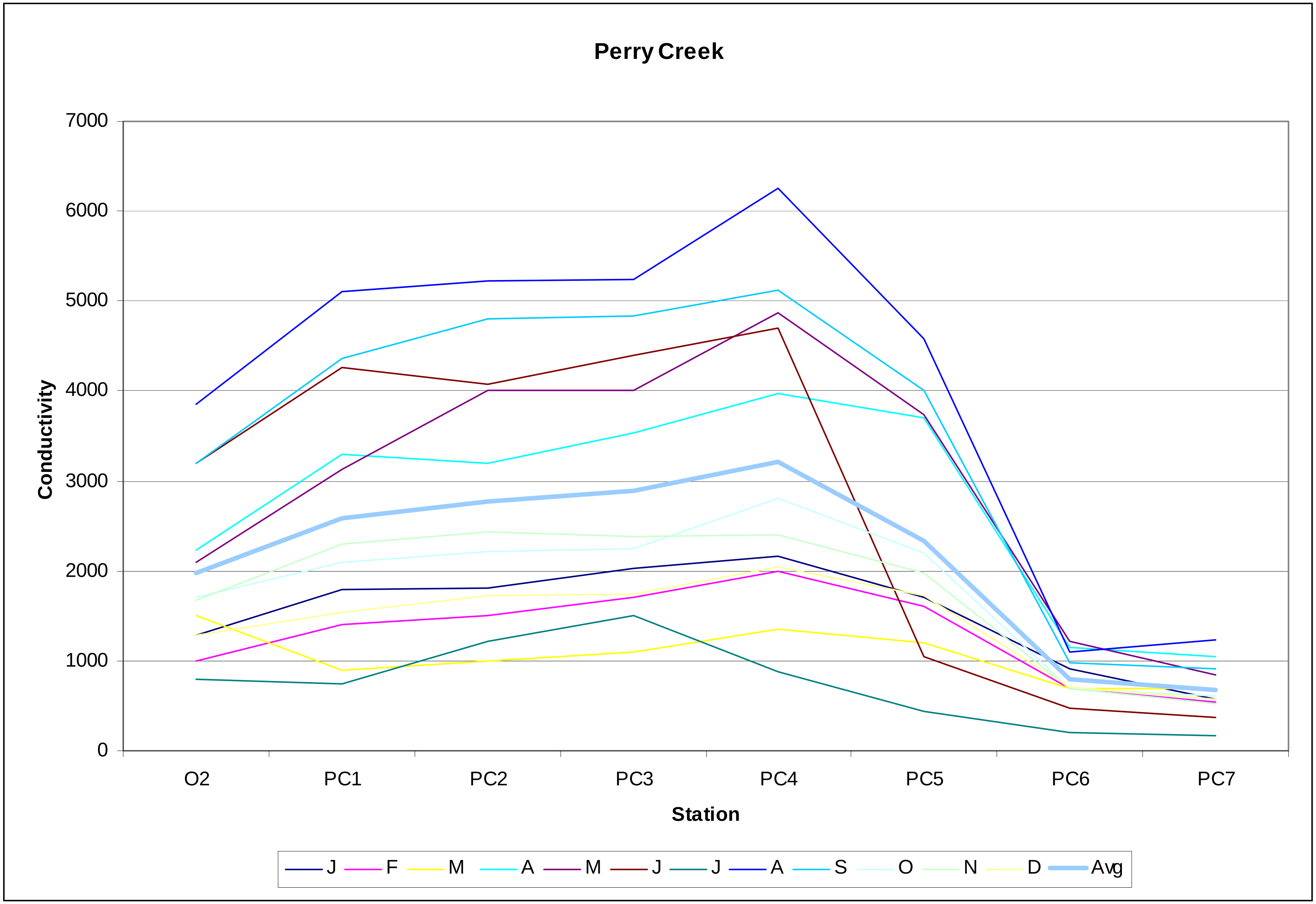
Appendix A - Perry Creek and Thompson Creek Data

Figure 5 Map of Stations from 1994 Eco Systems Study

	O2	TC1	TC2	TC3	TC4	TC5	PC1	PC2	PC3	PC4	PC5	PC6	PC7
J	1283	1025	1150	1000	417	372	1800	1817	2033	2167	1700	917	567
F	1000	750	783	700	350	333	1400	1500	1700	2000	1600	700	533
M	1500	1200	1300	1167	360	382	893	1000	1100	1350	1200	700	693
A	2225	1700	2000	1733	550	485	3300	3200	3533	3967	3700	1150	1050
M	2100	1400	933	1733	600	470	3133	4000	4000	4867	3733	1217	850
J	3200	2817	3483	2600	463	508	4267	4083	4400	4700	1042	477	377
J	800	1500	2100	1800	500	550	750	1217	1500	883	433	197	172
A	3863	2847	3358	2470	510	517	5100	5233	5250	6250	4575	1097	1233
S	3200	2658	3000	2400	508	508	4367	4800	4833	5117	4000	975	917
O	1700	1450	1633	1500	430	420	2100	2217	2250	2800	2200	700	617
N	1667	1100	1350	1200	390	417	2300	2433	2383	2400	1983	700	517
D	1283	1100	1200	1000	360	325	1533	1717	1750	2050	1733	708	567
Avg	1985	1629	1858	1609	453	441	2579	2768	2894	3213	2325	795	674

Conductivity Data from 1994 Eco Systems Study (micromhos)


Thompson Creek
Conductivity
4500
4000
3500
3000
2500
2000
1500
1000
500
0
O2
TC1
TC2
TC3
TC4
TC5
Station
J
F
M
A
M
J
J
A
S
O
N
D
Avg



Perry Creek
Conductivity
7000
6000
5000
4000
3000
2000
1000
0
O2
PC1
PC2
PC3
PC4
PC5
PC6
PC7
Station
J
F
M
A
M
J
J
A
S
O
N
D
Avg